Notice No.1

Rules and Regulations for the Construction and Classification of Ships for the Carriage of Liquefied Gases in Bulk, July 2018

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: November 2018

Amendments to	Effective date	IACS/IMO implementation (if applicable)
LR III	Corrigendum	N/A
Chapter 16, Section 16	1 July 2019	N/A
Appendix LR 6 (New)	1 July 2019	N/A

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LR III
Classification, Class Notations and Descriptive Notes

LR III.9 Types of tank

LR III9.1 These Rules include requirements for the carriage of cargo in containment systems incorporating integral, membrane, semi-membrane~~, internal insulation~~ or independent tank types as detailed in Chapter 4.

Chapter 16
Use of Cargo as Fuel

16.1 General

(Part only shown)

LR 16.1–02 The following information and plans are to be submitted for consideration:

- ~~Gas heaters including gas heating systems.~~ Heating or cooling arrangements for gas fuel temperature control including heat exchangers.
- Details of ~~LNG~~ liquefied gas pumps, including low and high pressure, intended to be used as part of the system using cargo as a fuel.

16.3 Arrangement of spaces containing gas consumers

16.3.4 All vents and bleed lines that may contain or be contaminated by gas fuel shall be routed to a safe location external to the machinery space and be fitted with a flame screen.

LR 16.3-01 There shall be separate vent lines from areas such as gas fuel tanks and gas consumers (engines etc.) that are independent of each other. Bleed lines shall also be independent of the vent lines. Vent and bleed lines shall all be led to a safe location in the cargo area. Such vent and bleed lines shall not be connected to a common header unless they are from a same area.

16.5 Gas fuel plant and related storage tanks

LR 16.5–02 Gas fuel ~~heaters~~ heat exchangers and compressors, of watertight construction, may be installed on the open deck provided that they are suitably located and protected from mechanical damage. Where the ~~heaters~~ heat exchangers and compressors are installed in a compartment outside the machinery space, the compartment is to be treated as a hazardous area to which the requirements of Chapter 10 for electrical equipment are applicable.

LR 16.5–03 The prime movers for the gas compressors are to be regulated to maintain a positive suction pressure and arranged to stop automatically if the pressure on the suction side of the compressors is lower than 0,0035 MPa gauge or other approved positive pressure appropriate to the cargo tank system or dedicated fuel tank.

LR 16.5–05 Pressure vessels for storing ~~methane~~ gas are to be of approved design and fitted with pressure relief valves discharging to atmosphere in a safe position in accordance with 8.2.12.

16.6 Special requirements for main boilers

16.6.2 Combustion equipment

16.6.2.4 Gas nozzles and the burner control system shall be configured such that gas fuel can only be ignited by an established oil fuel flame, unless the boiler and combustion equipment is designed and approved by recognized organization to light on gas fuel.

LR 16.6-02 For auxiliary boilers, gas nozzles and the burner control system shall be configured such that gas fuel can only be ignited by an established oil fuel flame, unless the boiler and combustion equipment is specifically designed for lighting directly on gas fuel, in which case details of the associated safeguards including processes and procedures are to be submitted.

Existing paragraphs LR 16.6-02 to LR 16.6-03 have been renumbered LR 16.6-03 to LR 16.6-04.

~~LR 16.6–04~~ LR 16.6-05 An inert gas or steam purging connection is also to be provided on the burner side of the shut-off arrangements so that the pipes to the gas nozzles can be purged immediately before and after ~~methane~~ gas is used for firing purposes.

Existing paragraphs LR 16.6-05 to LR 16.6-07 have been renumbered LR 16.6-06 to LR 16.6-08.

16.9 Alternative fuels and technologies

LR 16.9-03 Requirements for ships using LPG cargo as fuel are given in *Appendix LR 6 - Use of Liquefied Petroleum Gas (LPG) Cargo as Fuel*.

LR 16.10 Survey

LR 16.10–01 The gas compressors, ~~heaters~~ heat exchangers, pressure vessels~~, LNG~~ and pumps intended to be used in the fuel system and piping are to be constructed under Special Survey, and the installation of the whole plant on board the ship is to be carried out under the supervision of LR's Surveyors. On completion, the installation is to be tested to prove its capability.

Appendix LR 6 - Use of Liquefied Petroleum Gas (LPG) Cargo as Fuel

1 General

1.1 Use of liquefied petroleum gas (LPG) as fuel is subject to agreement by the Administration, as required by 16.9.1.

1.2 The requirements given in Sections 16.1 to LR 16.10 are to be applied to ships which use LPG cargo as fuel in machinery spaces of Category A, as applicable and as amended by the requirements of this appendix.

1.3 The requirements in this appendix apply to LPG which is composed of propane or butane or mixtures of both unless specifically identified otherwise.

1.4 References to ‘gas’ in the requirements in Chapter 16 are to be taken as referring to LPG.

1.5 A risk-based study as described in LR 16.9-01 and LR 16.9-02 is to be carried out. The following are also to be considered:

- LPG fuel system leakages and spills and their consequences, particularly the accumulation of LPG vapours at low points and their spreading over the ship's spaces through openings.
- Risks associated with any LPG fuel storage tanks locations such as the open deck.
- The location for leak detection in LPG fuel system is to be assessed by means of a gas dispersion analysis where gas shall be present outside the cargo area.
- Vent arrangements, including the possibility of two-phase release from any pressure relief system and the requirement for a blowdown vessel.
- Instrumentation and control system failure conditions, considering criticality and safety requirements.
- Failsafe positions of all remotely operated valves in the LPG fuel system.

1.6 In addition to the information and plans required in Section 16.1, the following are to be submitted for consideration:

- Risk-based study report as defined in Section 16.9.
- Details and schematic of vent mast (if separate from the cargo venting arrangements).
- Details and schematic of ventilation systems in spaces containing LPG piping and LPG consumers.
- Purging calculations and procedure for gas freeing the LPG piping after shutdown of the gas consumers. This is to include minimum nitrogen capacity requirements for shutdown operations (normal and emergency shutdown).
- Details and schematic of LPG detection system, *see* 13.6.17.
- Details and schematic of engine crankcase ventilation system.
- Plans and capacity calculation of safety relief valves fitted within the LPG fuel system.
- Calculations of the thermal impact are to be provided in accordance with 4.4 in this appendix.
- Emergency shutdown system including detailed ‘cause and effect’ matrix.

2 Use of LPG cargo vapour/liquid as fuel

2.1 The set point value of the Exhaust Gas High Temperature alarm required by *Rules and Regulations for the Classification of Ships, July 2018*, *Pt 5, Table 2.7.1 Engines for propulsion purposes: Alarms and slow-downs* shall be calculated to ensure that the uptake exhaust temperature at the funnel outlet is at least 10 per cent below the fuel gas auto-ignition temperature.

3 Arrangement of spaces containing LPG consumers

3.1 Gas detectors are to be fitted as defined in 16.3.2, and consideration shall be given to the locations, such as the bottom of spaces where LPG is likely to be present, and in the ventilation outlets.

3.2 Depressurisation lines containing liquid fuel shall be led to either cargo tanks, dedicated LPG fuel tanks, blowdown vessels or knockout drums. Blowdown vessels or knockout drums connected to the vent mast are to be provided with a means to detect and dispose of any liquid fuel.

4 LPG fuel supply

4.1 For LPG fuel pipes installed in pipes or ducts, in addition to 16.4.3.2, the ventilation shall be arranged to ensure efficient air flow at the lowest point of the annular space. Both the inlet to and outlet from the ventilated pipe or duct are to be located in a safe location in the cargo area.

4.2 Gas consumer isolation by automatic double block and bleed valve, given in 16.4.5, is to be arranged in a way that the LPG fuel system is safely depressurised and LPG fuel is vented to a safe location in the cargo area in accordance with 8.2.12.

4.3 Non-continuous double barriers as described in 16.4.6.2 are not permitted on ships using LPG as fuel.

4.4 Thermal stresses in pipework resulting from leakage and rapid expansion of LPG are to be evaluated.

4.5 The formula for calculating pipe rupture pressure in LR 16.4-05 is to be replaced by the following (for gas fuel only):

$$\boldsymbol{p} = \mathbf{p_0}\left(\frac{\mathbf{2}}{\boldsymbol{k}+\mathbf{1}}\right)^{\frac{\boldsymbol{k}}{\boldsymbol{k}-\mathbf{1}}}$$

p_0 = maximum working pressure of the inner pipe in MPa
k = C_p/C_v constant pressure specific heat divided by the constant volume specific heat
1,13 to be used for propane. For other gases or gas mixtures, the value shall be proposed by the designer.

4.6 For double wall fuel piping systems containing high pressure liquid fuel in the inner pipe, the design pressure of the outer pipe or duct shall not be less than the maximum working pressure of the inner pipe unless the design pressure of the outer pipe or duct has been based on calculations demonstrating the duct or pipe integrity to safely contain a failure of the inner pipe or, alternatively, the strength has been verified by representative testing.

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Published by Lloyd’s Register Group Limited
Registered office (Reg. no. 08126909)
71 Fenchurch Street, London, EC3M 4BS
United Kingdom

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